

GESNERIACEAE IN THE 21ST CENTURY

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INTRODUCTION

Since the founding of the Marie Selby Botanical Gardens (MSBG) more than 30 years ago, the study and display of Gesneriaceae have been an integral part of the institution. On the original Selby Gardens seal, gesneriads, as one of the three plant families in the design, are represented by *Columnea*. Although there have been periods of less activity on Gesneriaceae at Selby Gardens and in the world of research in general, recent research before and since the turn of the 21st century has made the Gesneriaceae an active area of study. The three articles on Gesneriaceae presented in this issue of *Selbyana* are evidence of the continuing commitment to research on Gesneriaceae at Selby Gardens. These articles are good examples of current research in the family.

Gesneriaceae research is being undertaken in a range of studies in many parts of the world. A symposium at Edinburgh, Scotland, in 2002 and the symposium at the 2005 XVII International Botanical Congress in Vienna, Austria, revealed the various activities and the many individuals who are now active in research in Gesneriaceae in Europe, Asia, Australia, Africa, as well as North and South America. MSBG and The Gesneriad Society (formerly the American Gloxinia & Gesneriad Society) have established an association to underwrite and encourage gesneriad research and publication at Selby Gardens. Funding, not only from MSBG, but also from the research endowment fund of The Gesneriad Society, the U.S. National Science Foundation, and many other sources has moved research forward on many fronts.

Classical floristic and revisionary studies, along with discovery and description of new genera and species, have continued unabated, exemplified by the article included here on *Nematanthus* by Chautems et al. In addition, other noteworthy revisions in the past 10 years include among many, the generic revisions of, e.g., *Agalmyla* (Hilliard & Burtt 2002) and the *Didymocarpus* complex (Weber & Burtt 1998) in the Old World and *Pearcea* (Kvist & Skog 1996), *Gasteranthus* (Skog & Kvist 2000), and *Solenophora* (Weigend & Förther 2002) in the New World. Floristic treatments include the spe-

cies-rich treatment of the Gesneriaceae for the Flora of China (Wang et al. 1998), which includes ca. 1/6 of the species in the family. Unfortunately, fewer specialists are encouraged to undertake large projects, however valuable they are for conservation (Skog 2005) and ecological monitoring (Kvist et al. 2004).

GESNERIAD FAMILY MEMBERS

For the ca. 3200 species in ca. 159 genera in Gesneriaceae listed in the World Checklist of Gesneriaceae (Skog & Boggan 2005a), the ten largest genera are the following:

<i>Cyrtandra</i>	±600 species
<i>Columnea</i>	±200 species
<i>Aeschynanthus</i>	±180 species
<i>Chirita</i>	±180 species
<i>Henckelia</i>	±155 species
<i>Streptocarpus</i>	±155 species
<i>Besleria</i>	±150 species
<i>Didymocarpus</i>	±100 species
<i>Agalmyla</i>	±95 species
<i>Paraboea</i>	±90 species

All of these genera have received or are receiving attention to some degree, some throughout their range, and some as topics for single-country floras. Much remains to be done. According to the Checklist, there are ±75 genera (nearly half of the genera in the gesneriad family) that have only one or two species. All of these small genera need to be examined more closely, using molecular techniques coupled with morphological examination, to identify their affinities. Anyone who visits herbaria to examine Gesneriaceae can find dozens to thousands of unidentified specimens, a sign that there are yet many genera and species to be discovered. In the neotropics alone, some medium-sized genera with numerous named species and unidentified specimens, such as *Drymonia*, *Paradrymonia*, *Nautilocalyx*, *Diastema*, *Monopyle*, etc., all beg for attention. Some areas of study currently are less emphasized, i.e., anatomy, cytology, carpology, pollen and seeds, and embryology; yet these and other areas are revealing useful characters and information. For example, cytological research is being undertaken in Edinburgh and Vienna (Möller & Kiehn 2004), flo-

ral arrangement (Citerne et al. 2000), evolution (Denduangboripant et al. 2001); and pollination ecology currently is under study by several students. The large number of publications that have appeared during the past decade prevents review here of all the areas of research in Gesneriaceae, but a search in the online Bibliography of Gesneriaceae (Skog & Boggan 2005b) shows the vast number of papers and directions of research.

As with many other families of plants, the advent of molecular studies, particularly systematics, has ushered in new techniques and a closer examination of taxa. The gesneriad family still comprises two or three subfamilies, Cyrtandroideae, Gesneroideae, and Coronantheroideae. Fortunately the family is not split up like the Scrophulariaceae (Olmstead et al. 2001) or other related families in the Lamiales. Several recent papers (e.g., Olmstead & Reeves 1995, Oxelman et al. 1999, Spangler & Olmstead 1999, Wagstaff & Olmstead 1997) suggest that the Gesneriaceae is one of the oldest families in the Lamiales and may provide insights into the origin and early diversification of the Lamiales. The article in this issue by Roalson et al. includes name changes resulting from a combination of molecular and morphological research, which found that molecular characters could be correlated with morphological differences. From this, it became clear that generic concepts and placement of genera in certain tribes have been incorrect. Placement and relationships become obvious in closer examination of the morphological characters, when preliminary clues are revealed by molecular studies. The article by J.L. Clark is the result of molecular and morphological studies of the genus *Alloplectus*. During fieldwork, Clark discovered that upside-down flowers serve to distinguish the resurrected genus *Glossoloma*, within the large *Alloplectus* s.l.

In recent years, molecular systematics has been used in many parts of the family, in many genera, to give us a clearer picture of the generic and tribal limits. Startling examples of possible resorting and combining of genera can be seen in the close relationship and nesting of *Saintpaulia* within *Streptocarpus* (Möller & Cronk 1997), *Capanea* within *Kohleria* (Roalson et al. 2005), *Anodiscus* and *Koellikeria* within *Gloxinia* s.s. (Roalson et al. this issue), and the close relationship of the genera *Achimenes*, a low terrestrial herb, with *Solenophora*, a genus of often large shrubs or small trees (Roalson et al. 2005). Poorly defined and heterogeneous genera are being divided, such as *Gloxinia* s.l., or *Alloplectus*, as a result of the combination of molecular and morphological studies. As a result, there is a re-

alignment of the tribes, as can be seen in the revival of tribe Sinningieae (Perret et al. 2003), and the description of the new tribe, Sphaerorrhizae. This latter tribe, described in the Roalson et al. article, necessitates the ongoing and forthcoming revision of the classification of the Gesneriaceae by Burtt and Wiehler (1995). These are just a few examples that can be drawn from recent literature.

CONCLUSION

Research in Gesneriaceae is underpinned by fieldwork, including field observations and specimen gathering for herbarium research. The recent acquisition by Selby Gardens of the valuable herbarium of the Gesneriad Research Foundation, amassed by the late Hans Wiehler, will provide valuable specimens for floristic and revisionary research by students. Fieldwork still forms the basis of all types of research in Gesneriaceae, including molecular and morphological investigations. More recent examples of fieldwork include the work of John R. Clark on *Cyrtandra* in the South Pacific, Silvana Martens on the pollination ecology in the Gesnerieae on the Caribbean islands, the search for Gesneriaceae in the unexplored mountains in Indonesia by the New England Tropical Conservatory and their colleagues at the Bogor Botanical Garden, and fieldwork by two of the authors of the articles included here: John L. Clark on *Alloplectus* in the neotropics and Alain Chautems on *Nematanthus* in Brazil.

Another fortunate result of fieldwork is the discovery of new species in the wild, species useful in horticulture for ornamental display and hybridization.

During the last two decades, the use of computers for data basing, word processing, and data analysis has increased productivity in all areas of research. Available online are the following resources: the World Checklist of Gesneriaceae (Skog & Boggan 2005a) and the Bibliography of Gesneriaceae (Skog & Boggan 2005b), both mentioned above; the Genera of Gesneriaceae (Weber & Skog 2003); Selby Gardens research in Gesneriaceae (www.selby.org); and the website of The Gesneriad Society (www.aggs.org). All of these websites list additional URLs (Uniform Resource Locators) that provide links to other websites on research in Gesneriaceae.

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